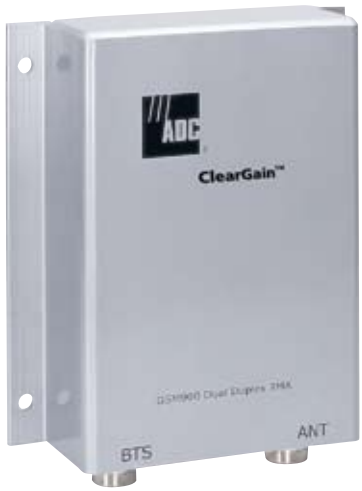
ClearGain® Tower-Mounted Amplifier

Europe, Middle East, Africa



As mobile usage continues to increase, service providers are faced with the challenge of optimizing and expanding their wireless networks to provide new and existing services. ADC's ClearGain® Tower-Mounted Amplifiers minimize the cost of network expansion and improve quality of service, allowing service providers to increase profitability from new and existing services.

The ClearGain Tower-Mounted Amplifiers (TMA) improve signal quality by boosting the uplink signal of a mobile system to increase receiver performance and improve overall coverage.

SPEC SHEET

Benefits:

- Highly advanced LNA amplifies RX signal for improved receiver performance and increase in coverage
- Dual duplex feature reduces the number of feeder cable runs by providing simultaneous operation of TX and RX with low TX loss
- Advanced filtering maintains the lowest possible noise figure for improved quality of service
- Slim, stackable design conserves tower space and reduces tower-related costs
- Seamless aluminum construction protects components from the elements
- Modular system is fully compatible with all base stations
- Power and alarming for up to six masthead units is provided from a single unit at the base station

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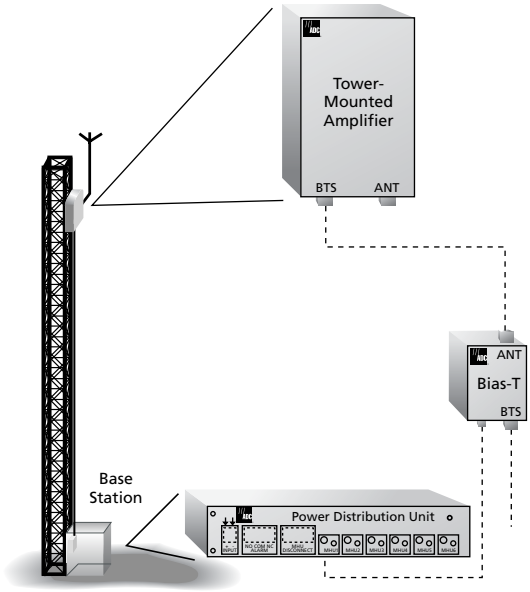
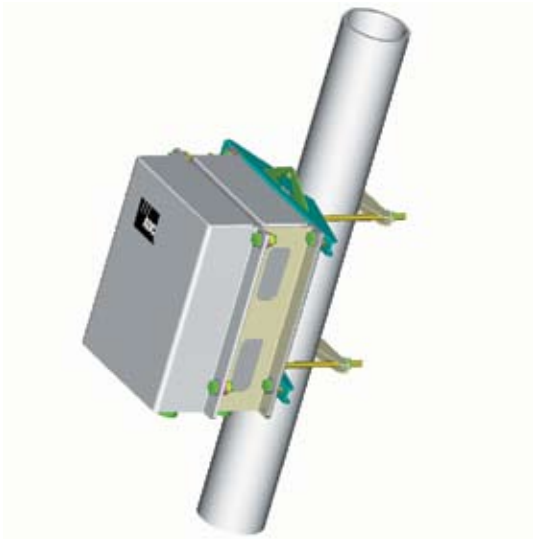
Introduction

Unacceptable network quality is one of the main reasons for mobile subscriber churn. With industry churn rates at their current rates, a service provider's entire customer base could be lost in as few as three years. The cost of acquiring new subscribers to replace the existing customer base can be enormous. Improvements in quality of service can directly impact a service provider's profitability through the cost savings associated with increased subscriber retention and the additional revenue gained from increased billable minutes of use resulting from improved signal quality.

While subscribers are willing to pay a premium for data services, improved quality of service is necessary to provide new data services. Due to the tradeoff between bit rate and bandwidth inherent to data services, improved signal quality is required to achieve the same level of performance at even higher data rates. ADC's tower-mounted amplifiers (TMAs) help provide this improvement in signal quality.

The main purpose of a TMA is to boost the uplink (RX) signal of a mobile system immediately after the antenna, thereby compensating for the loss in signal strength that occurs when the signal is passed through the coaxial feeder cable to the base transceiver station (BTS) at the base of the tower. ClearGain TMAs perform this amplification with the lowest possible noise contribution, resulting in a substantial increase in receiver performance and an improvement in overall coverage. These improvements in quality of service allow mobile subscribers to place more calls, longer calls, and successfully complete calls in an expanded geographic area, resulting in increased revenue.





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System Overview

The ClearGain TMA system is modular, consisting of a masthead unit (MHU), a power distribution unit (PDU) and a Bias-T Unit, providing full compatibility with all base stations.

The ClearGain MHU offers dual duplex operation and incorporates a highly advanced fixed-gain, low-noise amplifier (LNA) and high-performance filters for added reliability.

The ClearGain MHU features a slim, lightweight design. This allows two ClearGain MHUs to be mounted with one set of brackets, conserving valuable and costly tower space and reducing clutter on the tower. The MHU is protected with a strong, seamless aluminum cover designed to ensure superior weather protection and resistance to corrosion, resulting in increased reliability.

In the ClearGain TMA system, DC power is supplied to the MHU from a ClearGain PDU. The PDU also provides alarming and monitoring of feeder cable and up to six MHUs from a single unit. The flexible design of the ClearGain PDU allows it to be rack- or wall-mounted on the side of a BTS cabinet.

An external Bias-T Unit is used in conjunction with the ClearGain PDU. The Bias-T extracts DC power from the coaxial cable and inserts signals from the alarm and monitor circuits onto the coaxial cable.

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DD900 Masthead Unit Typical Specifications

ELECTRICAL SPECIFICATIONS	
Nominal Impedance of RF Inputs and Outputs:	50 Ohm
Frequency Range	
TX:	935 - 960 MHz or 925 - 950 MHz
RX:	890 - 915 MHz or 880 - 905 MHz
Duplex Filter Bandwidth:	25 MHz
Passband (RX)	
Gain:	12 dB ±0.6 dB
Noise Figure:	1.4 dB typical; 1.9 dB maximum
Dynamic Range	
Input at 1 dB Gain Compression:	+1.0 dB minimum
IIP3:	+15 dBm minimum
Insertion Loss of TX Path (TX to Antenna):	0.5 dB maximum
FILTER SPECIFICATIONS	
Passband Return Loss	
TX Band:	20 dB minimum; VSWR 1.29:1 maximum
RX Band:	20 dB minimum; VSWR 1.29:1 maximum
INTERMODULATION SPECIFICATIONS	
Input Power:	2 x 20 W carriers
GSM 900 TX:	-45 dBm minimum
GSM 900 RX:	-116 dBm maximum
GSM 1800 RX:	-98 dBm maximum
Outside Above Bands:	-45 dBm minimum
Maximum Input Power at Each BTS Input	
RMS Power:	200 W
Peak Power:	1.44 kW
Duration:	20 microseconds
Period Between Peaks:	550 microseconds
Peak Voltage at TX Input:	130 V
Input Power at Antenna Connector:	+16 dBm minimum
Fault Management:	Bypass
POWER SPECIFICATIONS	
Operational Voltage:	7 to 15 Vdc
Operational Current:	140 mA
Alarm Current Level:	175 mA ±5 mA
PHYSICAL SPECIFICATIONS	
Dimensions:	280 mm x 250 mm x 85 mm
Weight:	5.5 kg
Material:	Aluminum
Color:	Metal
ENVIRONMENTAL	
Temperature Range:	-40°C to +65°C
Outdoor Protection:	IP65
QUALITY	
MTBF: 180,000 hours at +25°C	
Lightning Protection	
Current Peak:	±5 kA
Rise Time (10-90):	10 microseconds
Peak Half Voltage Time (50-50):	350 microseconds
Test Generator Source Impedance:	1.6 Ohm
REGULATORY	
Safety:	EN60950
EMC:	EN55022B
Storage:	ETS3019-1-1
Transport:	ETS3019-1-2
Operation:	ETS3019-1-3
APPROVALS	CE

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DD900 FullBand Masthead Unit Typical Specifications

ELECTRICAL SPECIFICATIONS	
Nominal Impedance of RF Inputs and Outputs:	50 Ohm
Frequency Range	
TX:	925 - 960 MHz
RX:	880 - 915 MHz
Duplex Filter Bandwidth:	35 MHz
Passband (RX)	
Gain:	12 dB ±0.6 dB
Noise Figure:	1.4 dB typical; 1.5 dB maximum
Dynamic Range	
Input at 1 dB Gain Compression:	+3.0 dB minimum
IIP3:	+13 dBm minimum
Insertion Loss of TX Path (TX to Antenna):	0.7 dB maximum
FILTER SPECIFICATIONS	
Passband Return Loss	
TX Band:	18 dB minimum
RX Band:	18 dB minimum
Intermodulation	115 dBm
Maximum Input Power at Each BTS Input	
RMS Power:	200 W
Peak Power:	5 kW
Duration:	20 microseconds
Period Between Peaks:	550 microseconds
Peak Voltage at TX Input:	130 V
Input Power at Antenna Connector:	+10 dBm maximum
Fault Management:	Bypass
POWER SPECIFICATIONS	
Operational Voltage:	7 to 15 Vdc
Operational Current:	140 mA ±10mA
Alarm Current Level:	350 mA ±10mA
PHYSICAL SPECIFICATIONS	
Dimensions:	332 mm x 250 mm x 84 mm (13 in x 9.8 in x 3.3 in)
Weight:	6.6 kg (14.5 lb)
Material:	Aluminum
Color:	Silver
ENVIRONMENTAL	
Temperature Range:	-40°C to +65°C
Outdoor Protection:	IP65
QUALITY	
MTBF:	900,000 hours
Lightning Protection:	IEC61000-4-5
REGULATORY	
Safety:	EN60950
EMC:	ETS300 342-2
Storage:	ETS3019-1-1
Transport:	ETS3019-1-2
Operation:	ETS3019-1-4
APPROVALS	CE

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DD1800 Masthead Unit Typical Specifications

ELECTRICAL	
Nominal Impedance of RF Inputs and Outputs:	50 Ohm
Frequency Range	
RX:	1710-1755 or 1720-1765 or 1740-1785 MHz
TX:	1805-1850 or 1815-1860 or 1835-1880 MHz
Passband (RX)	
Gain:	12 dB
Noise Figure:	1.5 dB
Bypass Loss:	1 dB, RF Relay Connection
Dynamic Range	
Input at 1 dB Gain Compression:	+3 dBm
IIP3:	+13 dBm
Insertion Loss of TX Path (TX to Antenna):	1800TX <0.2 dB
UMTS RX and TX <0.2 dB	
900 RX and TX <0.1 dB	
Passband Return Loss	
TX Band:	>18 dB
RX Band:	>18 dB
Intermodulation:	-120 dBm
Maximum Input Power (RMS Power):	500 W
POWER	
Operational Voltage:	7 to 15 Vdc
Operational Current:	140 ± 10 mA
Alarm Current Level:	350 ± 20 mA
PHYSICAL	
Dimensions (HxWxD):	196 mm x 260 mm x 63 mm
Weight:	5 kg
Color:	Silver
Housing:	Aluminum
CONNECTORS	
Antenna Connector:	7/16 DIN female
BTS Connector:	7/16 DIN female
ENVIRONMENTAL	
Operating Temperature:	-40°C to +60°
Lightning Protection:	IEC61000-4-5
Vibration	
Storage:	ETS3019-1-1
Transport:	ETS3019-1-2
Operation:	ETS3019-1-4
REGULATORY	
EMC:	ETS300 342-2
QUALITY	
MTBF:	600,000 hours

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CG0000000DMDF00

CG0000000DFDM00

CG0000000NMNF00

CG0000000NFNM00

Bias-T Units

As part of ADC's modular ClearGain Tower-Mounted Amplifier (TMA) system, the ClearGain Bias-T Unit can be used indoors and outdoors in conjunction with the ClearGain Power Distribution Unit (PDU) to extend DC power, alarm and monitoring information between the PDU and the TMA. The Bias-T Unit, also known as the DC current injector, inserts DC power into the coaxial cable and extracts signals from the alarm and monitor circuits. ADC's Bias-T Unit is configured as a kit that includes the Bias-T Unit with standard international connectors, 3 meters of DC cable, and 1.5 meters of Grounding cable.

Typical Specifications

PRODUCT CONFIGURATION	
Main path connectors:	7/16 DIN or N-Connectors
DC injection/Sample port connector:	TNC jack (female)
Mounting and grounding:	/M8 / brk (MH - bulkhead mounting/ M - screw / brk - bracket)
TECHNICAL DATA	
Impedance:	50 ohms
Frequency range:	800 to 2200 MHz
Return loss:	> 19 dB
Insertion loss:	< 0.2 dB
RF CW power:	500 W
PIM 3rd order:	< -108 dBm
Surge current handling capability:	3 kA single
Operating temperature:	-40°C to + 65°C (-40°F to 149°F)
Waterproof degree:	IP 65
DC injection / DC bypass current:	< 2 A
DC supply / DC bypass voltage:	< 48 V
MTBF:	600,000 hours
Size:	55 mm x 95 mm x 40 mm (2.17" x 3.74" x 1.57")
Weight:	0.3 kg (.66 lb)

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Power Distribution Unit

Time and space are important considerations when selecting and installing wireless components at base transceiver station sites. The simple, compact design of ADC's ClearGain® Power Distribution Unit (PDU) is intended to help service providers save both. From a compact unit that is easily mounted on a wall or in a rack, the ClearGain PDU provides power and alarming for up to six ClearGain Tower-Mounted Amplifiers.

Features:

- Provides power and alarm functions for on-site monitoring of up to six masthead units (MHUs)
- Monitors condition of feeder cable
- Wall or rack-mountable to fit available space
- LED indicators for alarm functions
- Simple, compact design allows for easy installation and connections

The ClearGain PDU is an integrated unit that provides power and alarm functions for the ClearGain TMA system. The PDU monitors the current of the MHU. If an MHU fails, the ClearGain PDU gives an alarm indication. The ClearGain PDU also monitors the condition of the feeder cable. Alarm indicators identify failure in the feeder cable or MHUs and in which MHU the failure occurred, providing fast and easy on-site diagnostics.

The flexible design of the ClearGain PDU allows it to be rack-mounted or mounted indoors on the wall or on the side of a BTS cabinet.

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900/1800 MHz Power Distribution Unit Typical Specifications

ELECTRICAL	
Input Voltage:	20-56 Vdc positive/negative ground
Output Voltage:	6 x 13 Vdc each
Maximum Current Drawn:	1.2A
PHYSICAL	
Dimensions (HxWxD):	43 x 196 x 103 mm (1.69" x 7.72" x 4.06")
Weight:	<450 g
Color:	Silver
CONNECTORS	
Output for MHUs:	SMB, male (qty 6)
Power Connector:	4-pin male
General Alarm Connector:	3-pin male
Indicators:	Green OK/NOK LEDs Red General Alarm LED
Alarm output:	Alarm output is isolated 3-pin relay connection Normally open and normally closed connection available
ENVIRONMENT	
Storage:	ETS3019-1-1
Transport:	ETS3019-1-2
Operation:	ETS3019-1-3
Housing:	IP40
Temperature Range (Indoor Use):	-20°C to +65°C (-4°F to +149°F)
Lightning Protection:	IEC 1000-4-5 EMC
Approvals	
QUALITY:	MTBF 250,000 hours according to MIL-HDBK-217E Manufactured under ISO 9001 quality system
ACCESSORIES	
Basic Accessories:	Power supply cable (10 m), alarm cable (10 m), grounding cable (2 m) and wall mounting screws
Optional Accessories:	Mounting hardware for 19" rack mount

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Ordering Information

Description	Catalog Number
ClearGain Masthead Units	
900 GSM MHU	CG0900DDB25DU00
900 EGSM MHU	CG0900DDB25DUEG
DD900 FullBand MHU	CG0900DDB35DT00
DD1800 FullBand MHU, Low Band	CG1800DDB45DULO
DD1800 FullBand MHU, Middle Band	CG1800DDB45DUMI
DD1800 FullBand MHU, High Band	CG1800DDB45DUHI
Bias-T Kits*	
7/16 DIN male to BTS, 7/16 DIN female to ANT	CG0000000DFDM00
7/16 DIN female to BTS, 7/16 DIN male to ANT	CG0000000DMDF00
N male to BTS, N female to ANT	CG0000000NFNM00
N female to BTS, N male to ANT	CG0000000NMNF00
Power Distribution Unit	
ClearGain Single Power PDU Kit Includes power cable and grounding cable	CG0000000000PEU

*Bias-T, DC Cable 4.25 meters (SMB to TNC), Grounding Cable 1.5 meters (one end terminated)

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Creating a Bill of Materials

A typical site includes three components in various quantities.

You have six TMA options:

1. CG0900DDB25DU00	900DD GSM TMA
2. CG0900DDB25DUEG	900DD EGSM TMA
3. CG0900DDB35DT00	900DD Fullband TMA
4. CG1800DDB45DULO	1800DD Lowband TMA
5. CG1800DDB45DUMI	1800DD Midband TMA
6. CG1800DDB45DUHI	1800DD Highband TMA

The TMAs include:
- Mounting hardware
- Grounding lug
- PDU Cable

Ordering information: Order two per sector

You have four Bias-T options (based on connector type and orientation):

1. CG0000000DFDM00	DIN Male to BTS Port, DIN Female to ANT Port
2. CG0000000DMDF00	DIN Female to BTS Port, DIN Male to ANT Port
3. CG0000000NFNM00	N Male to BTS Port, N Female to ANT Port
4. CG0000000NMNF00	N Female to BTS Port, N Male to ANT Port

The Bias-Ts include:
- Grounding cable/strap (length 1.5 meters)
- Bias-T cable; go from Bias-T to the PDU (length 14 feet)

Ordering information: Order two per sector

You have one PDU option:

1. CG0000000000PEU	Single Power PDU

The PDU includes:
- Mounting Hardware
- Power Cable (length 10 meters)
- Alarm Cable (length 10 meters)
- Grounding Cable/strap (length 1.5 meters)

Ordering information: Order one per site

Optional Accessories:

Longer Bias-T Cable CG-PDU-30CABLE (30 foot Bias-T cable)
PDU Rack Mounting Brackets AUX-000076 (19" rack mounting bracket)
AUX-000076 and EB-17P (23" mounting bracket)
AUX-000084 (Siemens cabinet mounting bracket)

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